



EU CAP Network Focus Group

Recovery of abandoned agricultural lands

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1. Introduction

The Focus Group 'Recovery of abandoned agricultural lands' was established to promote innovative and sustainable maintenance and restoration strategies and showcase best management practices for reclaiming abandoned agricultural land. The Focus Group (FG) work focused on overcoming barriers that hinder the reuse or regeneration of abandoned land. As the role of Focus Groups is to provide new and useful ideas to solve practical problems, catalyse innovation and spread knowledge on existing good practices, this FG did not focus on policy instruments or their implementation.

The main question of the Focus Group was **How to foster new, practical ways for better management of abandoned agricultural land in a sustainable way?**

The activities of the Focus Group have been structured as follows:

- Collect and highlight best practices, approaches and methods in the process of reversion of land abandonment.
- Identify different types of land abandonment and the specific characteristics of each type of context.
- Identify main challenges and solutions to the regeneration process and reuse of abandoned land, covering both technical, agronomic, social as well as economic approaches.
- Identify further research needs from practice and possible gaps in knowledge.
- Suggest innovative solutions and provide ideas for EIP-AGRI Operational Groups and other innovative projects.

The FG was composed of 19 experts from 11 EU countries with different professional backgrounds.

The first meeting took place on the 24th and 25th of January 2023 in Santiago de Compostela, Spain and the second on the 3rd and 4th of May in Warsaw, Poland.

On the first day of the first meeting, the experts discussed the definition of land abandonment and the need to stress the dynamic dimension of the concept, followed by a debate on the different types of land abandonment, mostly related to the situations where it occurs. Examples from practice were shown, documented and discussed as inspirational for the possible recovery strategies. On the second day of this meeting a debate on Mini Papers (MPs) to be produced by the experts took place and the five MP topics were identified: The assessment and determination of a viable enterprise for abandoned lands; Sustainable land management as a lever for land abandonment; Ownership and behavioural aspects of land

abandonment; Getting stakeholders involved; What can we do to preserve agriculture in peri-urban areas.

In the second meeting, the draft Mini Papers were presented, received feedback from all participants, and were further discussed for sharpening their content and contribution to the main topic of the FG, the recovery of abandoned land. Following, the experts identified the main research needs which emerged from all discussions, and they progressed to select suggestions for the most relevant future Operational Groups.



2. Setting the scene

2.1 The concept of agricultural land abandonment

Land abandonment represents one of the major land cover and land use changes in Europe since the 19th century, especially in mountainous areas and semi-arid environments. In these marginal areas of Europe, land abandonment is an ongoing process which increases with globalisation in food systems, and which has severe consequences in the short as well as in the long term. According to the Joint Research Centre, about 20 million hectares (11%) of agricultural land in the EU is under high risk of land abandonment. And around 30% of agricultural areas in the EU are under at least a moderate risk of land abandonment (Andronic et al. 2020). The most severely affected countries are Austria, Cyprus, Estonia, Finland, Greece, Latvia and Romania. Effective agricultural land abandonment in the EU-27 might total 5 million hectares by 2030, or 2,9% of the current Utilised Agricultural Area (173 million hectares) (Andronic et al. 2020). Remote areas, mountains, islands and sparsely populated areas are particularly affected.



Starting with the **process**: Land abandonment is a term commonly used to describe uncultivated land, which means land used for agricultural purposes until recent times but not currently cultivated, with a noticeable cover of shrubs. It is commonly understood as land not subject to any cultivation practice nor intended for grazing, and often ends up being neglected land (Leal Filho et al. 2017; Pinto-Correia 1993, 2000; Verburg et al. 2010; Weissteiner et al. 2011). Agricultural land is abandoned as an economic resource when it ceases to generate any income flow for businesses or households and the opportunities for resource adjustment through changes in farming practices and farm structure are exhausted. Agricultural adjustment may be limited by traditional attitudes, inflexibility in production and fragmented structures and if alternative, more profitable uses cannot be found (e.g. forestry, recreation) land is abandoned from productive use (MacDonald et al. 2000).

To be able to find solutions, it is crucial to understand the temporal scale of abandonment (Dolton-Thornton 2021). Most frequently, abandonment is not a sudden process, where the status of land changes from one day to the other. In cultivated land, there is one season when the farmer decides not to intervene and cultivate. But there may be a continued use with grazing. And if there is grazing, there may be a moment when the pasture is not taken care of, but livestock may still enter the land in an occasional manner. Often

there is a slow and step-by-step process of less intensity in use, less frequency in management activities, less regular interventions, which ultimately leads to definitive abandonment at some moment in time. But while the use intensity decreases, the process which can be termed of semi-abandonment, can also be reversible. However, it leads to a narrative among those involved, of a decaying farming activity, which cannot attract new or young farmers, and this narrative accentuates the difficulty in breaking the decaying circle. Finally, when land has been abandoned for good, the return to agricultural use will be even harder to achieve – due to the shrub encroachment, the deterioration of farm structures, soil degradation and eventually fire succession.

Invasion through shrub encroachment is usually used as the easiest indicator of land which has been abandoned (Fig.1). However, attention needs to be taken in the use of this indicator. There may be shrub cover but the land may still be managed for occasional grazing and livestock production. Other uses may be beekeeping and honey production, game keeping and hunting, mushroom picking. When land abandonment is combined with depopulation at regional scale, shrub cover may be the right indicator for definitive land abandonment. Only a detailed knowledge of the area and of its farming and social structures can lead to accuracy in the classification of the land status.



Fig.1 – Remote rural area, Southern Portugal: overview (left figure) and detail of the land cover under the tree canopy (right figure). Silvo-pastoral systems in hilly areas with shallow soils and dry Mediterranean climate, agricultural use has been abandoned and shrub cover progressively increases.



Agricultural abandoned land refers thus to land that was previously used for farming purposes and is now no longer managed.

Secondly, the **drivers** are key to understand which solutions for recovery can be possible or more successful. The drivers of land abandonment are described in further detail in the next section, as such drivers strongly depend on the particular circumstances or contexts in which land abandonment takes place.

Finally, there are also the **impacts**. Rigid assessments of land abandonment as negative or positive, often found in literature, are to be avoided. The most visible consequence of land abandonment is the beginning of plant succession, leading to revegetation in vast areas, which provokes environmental, landscape and socio-economic impacts. These impacts affect not only the abandoned area and its local population but also society, which feels the impact in the production of goods and services by agricultural land as they are threatened by the abandonment, and the decay in attractiveness of the concerned regions (Fisher, Turner, and Morling 2008).

Agricultural land abandonment is a step-wise process, from land under current use to land progressively more extensively and rarely used, and finally abandoned.

On the one hand, land abandonment has long-term positive effects. At the soil level, there can be processes of halting soil erosion, decreasing soil salinisation levels, increasing soil organic matter and regenerating the formation of soil horizons and so increasing soil functioning and ecosystem services (Bouma 2021).

Positive impacts relate to rewilding, meaning increased natural vegetation and therefore enhanced biodiversity, when land is abandoned in some specific areas, particularly included in a context of large-scale intensive and specialised agriculture (Primdahl et al. 2019; Pinto-Correia and Primdahl 2012). Only when the scale of abandonment increases, the landscape may suffer simplification and risks of degradation – by loss of character and in some regions, fire episodes.

There are also negative effects of agricultural land abandonment, those which are most discussed and known. This impact is often context-specific, e.g. wildfire frequency and intensity, nutrient cycling, carbon sequestration, biodiversity, cultural landscape values, and water balance (Terres et al. 2015).

Land abandonment has a range of consequences for ecosystem functions and the provision of ecosystem services (Barnaud et al. 2021; Bouma, Pinto-Correia, and Veerman 2021). The impact on ecosystem services depends on one side, on the extension and range of the land abandonment itself, and on the other, on the conservation status of the area, agro-climatic conditions, and local factors.



Fig.2 – Shrub encroachment in former high-altitude pastures in a mountain landscape, and summer wildfires in the same mountain - wildfires grow in magnitude, as the available biomass increases with shrub encroachment and forest fragmentation by open areas, disappears (Serra da Estrela, Portugal)



Another impact results from changes in land use after abandonment. Examples from different places in Europe show how former agricultural land with decaying production interest, which has been abandoned or faces high risk of becoming abandoned, has been used already since the end of the 20th century, for tree production by afforestation. And more recently for energy production, with the installation of large-scale photovoltaic power plants.

2.2 Different types of land abandonment

Considering the diversity of circumstances where land abandonment is found, and its main drivers, three main types of agricultural land abandonment in Europe can be identified:

- 1. Mountain areas and islands: agricultural land abandonment is caused mainly by i. especially hard production conditions like steep slopes and rocky soils, ii. difficult accessibility making market integration more costly, and iii. pressures by tourism for other economic activities attracting the available labour and entrepreneurship. These areas may still maintain some rural population, however those who are there are involved in the tourism activities and services and neglecting farming. Agriculture in mountains and islands is often done in small and micro farming (Guiomar et al. 2018), and is particularly prone to suffering abandonment due to difficulties in competing in the global market. What exactly defines a small farm may vary according to the context, but in these geographical contexts small is often subsistence farming – and it is the subsistence character, which is determinant, since when the old farmers stop their activities, generation renewal is extremely difficult.
- 2. Marginal areas: agricultural land abandonment is due to extreme remoteness, combined with marginal conditions for agricultural production, mainly shallow soils and extreme

climate conditions linked with extreme temperatures and/or drought; remoteness means long distances and difficult access to urban areas, leading to first ageing of the population, and then depopulation. These areas are mainly found in the South of Europe, in remote areas with poor soils, and generally semi-arid conditions, and in the East, in former communist countries. Here there is a particular situation, since land has been abandoned both because of its lack of productivity and accessibility, but also due to fuzzy property rights and rights of use, still not fully solved. Some parts of Atlantic Europe, like Ireland or Scotland, may register similar processes, explained by their remoteness and low agricultural productivity.

- 3. Peri-urban areas: in the expansion process of urban areas, former agricultural land is replaced by residential use, industry and services; or it may be abandoned expecting those changes to happen. In total area, this process attains smaller extensions than the ones described in 1. or 2., but it is highly relevant to European society today due to the closeness to urban centres and the possible interest in having these areas in production again, for provisioning short food chains, securing food security to the most de-favoured social groups, creating green corridors, leisure space and time for urban citizens.

3. Challenges and opportunities: key domains of action for agricultural land recovery

For identifying recovery mechanisms that may work in each type of context where land abandonment occurs, a first step is to identify the challenges faced and the specific opportunities that create spaces of intervention. A range of such challenges is listed in Table 1.

Table 1 – Challenges and opportunities in each type of land abandonment context

Type	Challenges	Opportunities
Mountain	Lacking infrastructures, low accessibility, slow internet, making logistics difficult	Last pristine territories, high valorisation by society
	Ageing landowners and population in general, no generation renewal	Tourism and ecotourism as source of income and of territory management
	Return of large carnivores like wolf and bear	Preventing wild fires and compensation for this service
	Increased fire risk and extreme fire events	IT possibilities for fast internet



Type	Challenges	Opportunities
	Soil erosion and degradation	Local quality agri-food products; labelling and food quality schemes
	Farm small scale and fragmentation	Hunting and wildlife observation
Marginal	Ageing landowners and population in general, no generation renewal	Hunting of large mammals; hunting parties
	Poor soil; soil erosion and degradation; lack of water	Large areas may be attractive for young entrepreneurs, and new activities
	Increased fire risk and extreme fire events	Production for growing biomass demand
	Out of focus of public policies	
	Remoteness and extreme periphery	
Peri-urban	Soil sealing and land uptake	Population dynamics and diversity of economic activities
	Insecurity due to urban proximity	Closeness of market for agri-food products; short supply chains
	Market pressure for land for real estate	Farming as leisure for urban population and growing demand for proximity green areas
	Soil, water and air pollution	Strong focus of public policies and planning
		Training facilities for new farmers/hobby farmers

What the table shows is that in all situations there are multiple challenges but also opportunities, and that they differ from one context type to the other. Opportunities are less obvious in the marginal areas, those with remote locations and hard biophysical conditions - where the basis for possible recovery seems to be weaker and fragile. Mountain areas have severe challenges but also many possible resource bases for a change in the sense of

recovery. And peri-urban areas have many assets that the others do not have, such as the closeness to markets and to a demanding population, and the possibility of acting as green infrastructures in the urban fabric.

Table 2 - Challenges and opportunities which are common to all types of land abandonment contexts

Type	Challenges	Opportunities
All types	Training of all actors	Demand for local and unique food products
	Absentee land owners, land immobility and legal problems: property rights and rights of use of land	Increased demand for biomass - energy transition
	Biodiversity loss and difficult recovery	Ecosystem services valorisation and compensation



In all situations and considering possible solutions for recovery, a fundamental difference needs to be acknowledged between, on the one hand, farming activities and farm-related business models that process farm-based products, and on the other hand other economic activities that are important for attracting new people, creating income and job opportunities. With this, these activities also create a social and economic dynamic in the rural areas that have abandoned land and/or high risks of abandonment. These are not directly impacting on the use of the land but nevertheless have a key role in creating or enhancing the ground for those farm activities and for people to stay in the land.

The FG experts identified some transversal challenges, related to opportunities for change if they are solved and used adequately and wisely. They will be described below. They correspond to the key issues that have to be dealt with, if recovery is to be possible, and successful.

These key issues identified can be conceptually linked to the three different **dimensions of land**: that of being an **institutional object**, socially defined by diverse property right regimes and frameworks; that of being an **economic asset and production factor**, supposed to provide wealth revenues and, last but not least, that of having a **physical dimension**, the actual basis of life in general and of agriculture in particular. From this perspective, land recovery processes should consider the three dimensions in an integrated way, tackling the constraints that may hinder land use activation at any of them. Partial approaches may render little results when one of those land dimensions is not properly considered and, when needed, addressed.

The first dimension includes both how property rights on land are defined and managed in a given institutional setup and which actors may have a stake on a particular piece (or set of pieces) of land. These two aspects are addressed by two Mini Papers (Mini Paper 4; Mini Paper 3), which focus on the importance of, first, understanding the institutional and social dimension of land, and getting it right. The main takeaways are elaborated in the chapter below (see sections 3.1 and 3.2).

Considering the economic dimension requires us to acknowledge that agricultural land, despite its traditional use model, is dynamically influenced by evolving markets – also driven by social values – and technology. Like previous structures might have collapsed due to lack of competitiveness, new business models may be designed, by exploring new land values or resources, new organisational approaches and/or new, appropriated, technologies (see section 3.3 and in particular Mini Paper 1).

Last but not least, the physical dimension of land is what provides sense to the two previous dimensions. Abandoned land may be degraded and/or may have lost its [agricultural] functional characteristics. Reverting this situation may demand an intense action and, frequently, high input levels. Both situations could be counterproductive, i.e. from the perspectives of soil, biodiversity, climate or energy, too costly, or both. Therefore, a sound land management strategy is essential in the recovery process – as it is the first step in avoiding its abandonment and/or degradation. Mini Paper 2 elaborates on this aspect and section 3.4 gathers the main highlights.

3.1 Land tenure and farm structure

Land tenure arrangements, i.e. the rights that people hold in relation to land, and their security in particular, are a key driving force in land abandonment (Terres et al. 2013; Subedi et al. 2022). Tenure security refers to the degree to which individuals or communities have legal and social protection over their land rights. There are positive economic, social and environmental effects of improved tenure security (FAO 2002). In the context of land abandonment, tenure security can be a critical issue for those who remain on the land or are considering returning to it. Secure tenure rights (ownership and use) can have a positive impact on productivity and income in agriculture, provide increased access to credit, and enable investment in land, e.g. either in re-cultivation and improvements, or investments into high value-added crops and specialty products for which niche markets exist. Secure land tenure also leads to increased investment in soil conservation, and sustainable land management practices.

The Food and Agriculture Organization of the United Nations defines land tenure as the relationship that individuals and groups hold with respect to land and land-based resources, such as trees, minerals, pastures, and water. **Land tenure** rules define the ways in which property rights to land are allocated, transferred, used, or managed in a particular society (FAO 2002).

To understand how land tenure plays for land abandonment, it needs to be coupled with farm structure (Table 1). Farm structure that is characterised by excessive fragmentation and a small farm/plot size as well as spatial discontinuity, is a key constraining factor in farms' viability and their competitiveness in the global and regional markets, and thus a driver of abandonment of land (Terres et al. 2013; Leal Filho et al 2017; FAO 2023).



When farms are very small and the obtained production cannot compete in the global market, agricultural use tends to be abandoned. In marginal rural areas or areas with difficult accessibility, this is followed by outmigration, ageing rural population, and absentee landowners from the village where their land is located. Such processes of depopulation have started in some regions of Europe in the middle of the 20th century and they have now been ongoing for generations. They lead to a physical disconnection from land, as well as a legal disconnection in cases where the formally registered owner is deceased, inheritors are many and dispersed throughout the country or even the world, and inheritance proceedings remain unresolved. As ownership of small plots is divided among many inheritors, the value from a possible sale or leasing is insignificant and it therefore does not motivate the effort to regularise land ownership. The formalisation of one or more heirs to be registered as the new formal owner entails certain costs and it can be a complex and lengthy process. The implicit costs in the process of formalisation of inheritance represent efforts in the families to discuss and agree on the future of the property, e.g. whether the estate should be divided equally among the heirs (if legally possible), or if one of the heirs could buy out the shares of the other heirs who are uninterested in farming. Inheritance processes are often associated with a severe risk of conflicts in families. Land in co-ownership is more likely to be used by less efficient farm organisations or to be left abandoned (Swinnen et al. 2014).

The outcome of this process is a diversification of land plots that remain unused year after year, without a known and acknowledged owner of property or use rights.

Land tenure and tenure insecurity have been identified as one of the main issues to be solved if land abandoned is to be recovered. However, different, complex and long legal procedures are required in cases when an owner or owners of the land is/are unknown and cannot no longer be identified. Few countries have updated data on the land which is abandoned, and the property or use rights owner is seldom identified. This makes it difficult to assess the extent of the effort and resources required.

For recovery, functioning agricultural land mobility of both ownership and use rights is key to create access to land for new uses. By land mobility we mean a broader spectrum of options than in land markets, including sale and rental markets, but also other options like different types of joint ventures and partnerships/collaborative

approaches. Timely redistribution of property rights for land, followed by measures and land management instruments can more directly tackle land abandonment. A system of land market management may be useful when transaction costs are high and/or land markets (sale and/or rental) lead to low land mobility and structural decay. Depending on the prevailing land tenure arrangement underlying the farm structures, i.e. based on rent or ownership of land, either sales or rental market regulations will dominate (Swinnen et al. 2014). Tenure security can be safeguarded in various forms, not only through formalisation of land-related rights. It can be achieved through clear long-term or short-term rental contracts, or other, including collective arrangements.

A number of 'technical' land registration problems exist in many countries, which slow down or prevent formal land market activities. Even if land rights are registered, transactions might be hampered because of the low quality of the recorded information. Some of these registration problems, such as misspelled names of owners or a new name of the owner after marriage, are easy to resolve. Others, for example inconsistencies between the property titles/cadastral maps and the situation on the ground, inaccuracies of boundaries, etc. are more complicated and more costly to solve. They require land surveying and the involvement of owners of neighbouring parcels.

The complexity is higher when different problems overlap, for example, inheritance with informal land transactions. When the level of informality reaches a certain share of the land parcels, the entire community, as discussed, sinks into a 'swamp of informality', negatively affecting all agricultural and rural development in the community. Only dedicated initiatives with specific resources and long time spans can lead to solving such complex questions - or identify and set in place other mechanisms which create the ground for access to land, even though the formal tenure dimension may not be solved.

Often going hand in hand with land tenure problems, structural issues of land fragmentation and small farm sizes restrain farm profitability and lead to land abandonment (Guiomar et al. 2018). This challenge is listed in Table 1. To address extreme fragmentation, various land management instruments can be implemented, including land consolidation, land banking, facilitation of lease, and active management and/or privatisation of state-owned agricultural land. These instruments allow for the enlargement of the farm unit.



FAO defines land consolidation as a legally regulated procedure led by a public authority and used to adjust the property structure in rural areas through a comprehensive reallocation of parcels. It is coordinated between landowners and users in order to reduce land fragmentation, facilitate farm enlargement and/or achieve other public objectives, including nature restoration and construction of infrastructure (FAO 2020). Land consolidation is a public purpose instrument, therefore public funding plays a fundamental role, particularly in marginal areas and in the context of land abandonment. Land consolidation should go hand in hand with land use planning and spatial planning provisions, to ensure that the outcomes lead to sound land use, i.e. avoiding environmental side effects or unintended soil sealing by further urbanisation.

Collective arrangements or the intervention of public authorities are in any way required, if land tenure and land fragmentation questions are to be solved in order to facilitate access to land and create conditions for profitable land use businesses.

This topic is further explored in Mini Paper 3 ('Ownership and behavioural aspects of land abandonment').

For agricultural land that is located in peri-urban areas, the pressure often comes from speculation and this is what leads to abandonment. This particular process will be developed in another section.

3.2 Identification and involvement of multiple stakeholders

Agricultural use is not only a subject of relevance for the plot owner or manager, but it also has a territorial dimension (Rizzo et al. 2022), due to the impact of agriculture on the overall landscape and due to the relevance of the landscape context for the farming system. This concerns multiple land owners, with very different profiles, different attachment to the land, and different residential locations. And furthermore, when land is abandoned and covered with shrub, it does not only mean a loss of income to the landowner, but it can also cause losses to neighbouring landowners, from the proliferation of weeds and other unwanted vegetation to shrub encroachment and the increased risk of forest fire (Table 1). Neglecting access paths and shared irrigation systems will also pass on losses to neighbours.

Finally, there is the more intangible damage caused to the local landscape and economy where the sight of derelict buildings, broken walls and fields of weeds conveys neglect and deprivation. Therefore, the whole local community in fact suffers from the abandonment of the land – not just the existing community but the one which could potentially exist in the area and does not, partly due to the repulsivity caused by the share of abandoned land.

There are cases where abandoned land is seen as an asset for nature conservation purposes and is therefore considered positive by nature conservation bodies, NGOs and official entities. However, there is an issue of scale. Those who see abandoned land as positive consider broad societal advantages at a higher scale. In any case, these are also stakeholders who might be considered when recovery goals and strategies are assessed.

Recovery thus involves multiple parties or stakeholders at different and nested scales, working through distinct stages. Considerable efforts, skill and trust are required to ensure a successful outcome. Land owners or owners of use rights need to be involved, when they are known. When they are not known, strategies and mechanisms are needed that can make individual or collective rights of use available.

New entrants to farming, new business entrepreneurs and other actors who might be interested in using the land are key in the process. Inhabitants of the area and those representing the local community are also central. Other users, such as hunters or hiking groups and open air leisure companies have a stake and should also be involved.

The authorities that deal with regional and rural development planning are key actors. They may be the ones to launch and support processes of recovery, as initial costs can be high. Other organisations, such as NGOs, Local Action Groups (LAGs), farmer associations, etc. may be willing and able to trigger and lead a land recovery process at local level. Besides, as noted above, organisations that are responsible of dealing with land administration system (i.e. cadaster, LPIS, land book, etc.) should also be involved to ease the procedures when there are land tenure related problems. Successful recovery requires a strong commitment for the initiating authorities.



Commitment to a recovery process will not always be of interest for all stakeholders mentioned above. Increasingly, there are different examples in Europe where landowners may be compelled to act by a mixture of tax-based incentives, for example by the designation of a higher property tax band on land that is considered abandoned, as is the case in Lithuania, or by legal obligations following the majority approval of a common plan of action, as is the case in Galicia.

Alternatively, finding new users for land that was previously abandoned may require targeted campaigns and dedicated policy mechanisms, which can be of national or local nature. One pathway can be a collaboration with the educational institutes for young farmers, with representative bodies such as the local Chamber of Agriculture and the Farmers' Unions, as well as technical engineering offices. But mostly, supporting the new entrants in building up a viable business model is a key condition. Where conservation matters are more to the fore, it is important that lead authorities engage with both the hunting and fishing associations as well as with wildlife and nature conservation groups. In some countries, the private real estate sector may be an important sector to engage with. In Bulgaria for example, private real estate brokers who work in rural areas can help find new users by bundling small parcels into larger packages, thereby making them much more attractive for new land users. In other countries, such actions might be carried out by land banks, which can often be at the forefront of campaigns to raise awareness and to facilitate new uses.

This topic is further developed in Mini Paper 4 ('Identifying and securing the involvement of stakeholders in combatting abandoned land'). For peri-urban land that is abandoned, other stakeholders become much more relevant. This mostly concerns those that link to consumers, and create dynamics in short supply chains, which can connect agricultural use and business to proximity markets. This will be dealt with in a separate section.

3.3 Opportunities for viable business models

In farming, it is the productive value of the land that is traditionally exploited by growing crops and raising livestock. When its produce loses the ability to compete in an increasingly globalised market, this

value is lost, and is no longer viable. The root causes of agricultural land abandonment are definitively linked to the loss of viability of traditional farm enterprises. And this is related to large-scale drivers, such as the general intensification of agriculture, global markets, and the vastly increased scale of the large and increasingly multinational companies that control every stage of agri-enterprise, from research to consumer preference. Under such drivers, it has been practically impossible for many small farming communities in mountainous and otherwise marginal areas to compete.

If farm use in abandoned land is to be economically viable again, three options exist: 1) efficiency in the use of production factors and in farm system organisation, as for example in farm structure through land consolidation, is achieved and economic viability of the farm production increases; 2) added value is obtained for the production, by processing on the farm, by opening up new markets including through short supply chains, reshaped organisation or collective arrangements in the value chain; and 3) other values of the land for which the market is prepared to pay can be identified and exploited through new enterprises. Heightened awareness of ecosystem services and the concern for such values such as water quality and biodiversity form an opportunity. Often the success depends on a combination of more than one of these strategies.

New viable food-based enterprises can rely on their environmental credentials, in shaping their image for a new environmentally conscious market. To benefit from the increasing societal awareness for environmental quality, this requires, in the first instance, an imaginative but realistic understanding of the other functions of the farm landscape and the values that these give rise to. Second, the agricultural products need to have a strong identity linked to their territory of origin. Third, they can benefit from the knowledge and interest of proximity consumers about the territory of origin. However, to reinforce their market position, it is relevant to also be capable of looking at wider international markets. The new business models must be based on the identities, the uniqueness and the peculiarities of the products. They have to be oriented towards customer targets that have a high spending capacity, a high sensitivity for environmental quality wherever in the world they are situated. The same goes for increased consumer interest and demand for food excellence, and food that originates from special places and processing techniques.



It is the willingness of wider society to pay for these values that turns these other functions into resources; i. e. the changing values of society open up new resource avenues.

Twenty years ago, it was almost inconceivable for a small farmer to sell directly into world markets. Today, this is possible. New tools are now available, that can be used even by small farmers in local areas, especially young farmers and entrepreneurs of different age groups. This can be the way to increase incomes considerably.

However, it is not always possible to capitalise on the above mentioned assets. Even if all the other criteria are present, lack of capital is often the sticking point. One option can be to engage in collective arrangements so that the required capital is gathered. The collective strategy for making businesses viable can have different contours, such as working together to place a product in the market, for example, or buying production factors together, or by working more aligned locally and regionally along the value chain. Collective strategies for increasing the viability of farm-related businesses require both soft skills of those collaborating, and leadership for initiating the process and solving problems along the way. Here, the intervention of dedicated resources, by local public entities, local associations and project funding, can be a fundamental key driver. Success examples that can be identified in rural areas under generalised land abandonment generally rely on these initiating efforts and investment.

Another option for the farmer may be to capitalise on the environmental services that his farmed land provides through agri-environmental schemes, which pay him to manage the land in the way that is necessary for the maintenance of these services (Lomba et al. 2020). This is the approach taken by many results-based agri-environmental schemes, where payment is made for the environmental results, for example for extensive grazing systems, restoration of hedgerows, organic production developing biogas or biochar. Examples include the results-based payments that are paid in Ireland under its ACRES scheme, or the programmes for farmers in mountain areas of species-diverse Alpine grasslands. 40 to 50 per cent of the income of an average mountain farmer in Austria originates from the Common Agricultural Policy (CAP) compensations. In these areas, farming is continued in the low-level extensive way that is essential to preventing the grassland from reverting to scrub, but that is wholly insufficient to providing a sufficient income on its own.

Consequently, a significant share of the income of farmers, who keep on farming in mountain areas and other areas that face production constraints, consists of payments for foregone income and additional costs in fulfilling the requirements of the CAP measures they subscribed for.

Furthermore, an option is that private companies pay for the delivered ecosystem services, as the supplement companies such as Vittel or Coca Cola are prepared to pay to suppliers for enhanced water quality or the biodiversity that is associated with production. This type of contract or arrangement surely has a future. The voluntary carbon market for carbon credits and soon the market for biodiversity credits will very soon make such arrangements more frequent and widespread. Farms in extreme marginal locations may become viable again by selling their carbon credits in the voluntary markets, with, as end buyers, large-scale companies who are in demand of carbon compensation. However, for these new markets to actually contribute to the viability of farms and the local territories, a good and fair governance framework needs to be envisaged and properly communicated to farmers and other relevant local actors. Otherwise, there is a significant risk that this opportunity may instead become a threat, with external players extracting the benefits, leading to undesired side effects.

Last but not least, one common practical reason why land remains abandoned is the high cost of recovery. Before abandoned land can be made available for new use and new users, it needs to be cleaned of unwanted vegetation, access paths restored, and fences fixed. All of this can cost values of thousands of euros per hectare. Where this is the case, it is important to strike a balance between the rights and responsibilities of the owner and the public interest in seeing land restored to production or to otherwise managed use. According to examples from Spain, in cases where a landowner clearly does not have the resources to pay for restoration costs, it may be possible to use public funds. In other cases, restoration costs can for example be shared between the current landowner and future tenant, by offsetting the restoration costs against future rent. Public intervention will most probably be needed in most cases, at least where land abandonment attains large shares of the land in a given area. Here also, considerable resources need to be dedicated to the cleaning and restoration process, if conditions for viable enterprises are to be created.



Knowledge and training are key elements of the pathway for viable enterprises to flourish, and this requires the existence of efficient advisory services that all farmers can have access to. Basic principles of the AKIS (Agriculture Knowledge and Innovation Systems) should guarantee this inclusive perspective. Successive AKIS reports of the Standing Committee on Agricultural Research (SCAR) state that the agricultural sector in Europe continues to have considerable but underused innovation capacity. The insufficient or too slow uptake of new knowledge and innovative solutions in farming hampers a smooth transition towards a more sustainable agriculture, as well as the farming sector's competitiveness and sustainable development. Therefore, all actors involved must simultaneously step up their efforts to develop new knowledge and innovative solutions. If this is the case for the agricultural sector generally, the need for adequate AKIS is even more central in marginal and remote areas where abandonment is a problem. To set up new and viable enterprises, dedicated advisory services and innovation mechanisms have shown to be central (EU SCAR AKIS 2019).

This topic is further elaborated in Mini Paper 1 ('The determination and assessment of viable enterprises for abandoned lands').

3.4 Sustainable land management towards resilient farm systems

SLM includes approaches such as soil and water conservation, natural resource management and integrated landscape management (ILM). Furthermore, it involves a holistic approach to achieving productive and healthy ecosystems by integrating social, economic, physical, and biological needs and values, and contributes to sustainable and rural development.

Sustainable soil management is an essential prerequisite for the long-term sustainability and viability of farming. Both the scientific literature and practice examples demonstrate that the best management agricultural practices have a direct impact on ecosystems and natural resources, and that they can steadily increase farmer's income even in regions with scarcity of resources for agricultural production, and agriculture's resilience to climate change.

However, history has shown that even sustainably managed land and soils are not protected against land abandonment if farmers cannot

make a living from it. There are many other factors, such as problems in competing in an increasingly globalised market, which can lead to abandonment even in sustainably managed agricultural land.

Therefore, in order to reduce the risk of land abandonment on soil that is sustainably managed (e.g. extensive mountain meadows), or in order to engage in a recovery process, the outcomes (biodiversity, landscape, clean air and water, soil carbon sequestration, etc.) of this management efforts need to become an additional income pillar next to the food produced on this area. Mechanisms for this compensation to revert into farm businesses are crucial in the process of recovery.

The United Nations defines **sustainable land management (SLM)** as "the use of land resources, including soils, water, animals and plants, for the production of goods to meet changing human needs, while simultaneously ensuring the long-term productive potential of these resources and the maintenance of their environmental

The capacity of a soil to perform ecosystem functions and provide ecosystem services, depends on key determinants of soil quality (Bouma 2021; Bouma, Pinto-Correia, and Veerman 2021). In this context, soil organic matter (SOM) is a key constituent, which strongly impacts soil quality because of its positive effects on the soil's physical, chemical and biological properties. Indeed, depletion of SOM sets in motion a downward spiral with cascading adverse effects, one of which is also land abandonment. A severe and rapid depletion of SOM could also be the result of conversion of natural areas into cultivated lands that rapidly reduce SOM and carbon stocks (Zdruli et al., 2014). Other adverse effects are related to the destruction of soil structure and tilth, along with increased emission of greenhouse gases (GHGs) into the atmosphere. Based on management practices, soils could be both sources and sinks of carbon.

A recent trend that is quickly expanding also in Europe is the so-called carbon farming. Carbon Farming is a new farm approach to optimise carbon capture on agricultural areas by implementing practices that are known to improve the rate at which CO₂ is removed from the atmosphere and stored in plant material and/or soil organic matter.



The whole process is based on the implementation of SLMs that include regenerative agricultural practices such as minimum or no tillage, crop rotations, cover crops and use of organic matter. If correctly implemented, it provides farmers additional income and reduces the risks of land abandonment – as described in the previous section.

The EU Carbon Removal Initiative was open for public consultation between February to May 2022. This initiative will propose EU rules on certifying carbon removals, and it will develop the necessary rules to monitor, report and verify the authenticity of these removals. The aim is to expand sustainable carbon removals and encourage the use of innovative solutions to capture, recycle and store CO₂ by farmers, foresters, and industries. This represents a necessary and significant step towards integrating carbon removals into EU climate policies.

Here also, and as already mentioned in the previous section, an essential element for the changes in management to take place is the existence of efficient advisory services that all farmers can have access to. The actors which can play a role in new farming systems and farming practices should be supported and guided, so that the best knowledge is integrated in the business model and problems are corrected along the way. An integrative AKIS that pays attention to the opportunities but also fragility of abandoned areas and related actors is key in creating a conducive environment for quicker innovation and better valorisation of existing skills and knowledge, to achieve solutions for land recovery.

The land management question is further elaborated in Mini Paper 2 ('Sustainable land management as a lever to land abandonment').

3.5 The particularities of peri-urban land abandonment

Peri-urban agriculture benefits from a close urban-rural linkage. The proximity of urban areas is a threat due to the process of progressive urbanisation, scarcity and high prices of the land, in competition with industrial or residential uses. This struggle can move potential farmers away. But this urban proximity is simultaneously an opportunity due to consumer market proximity and awareness of the quality of food from short supply chains, and also due to consumers with more economic power and openness to niche crops than otherwise in the countryside.

The threat is driven by the pressure from the growth of cities, and the demand for land and changes in land uses that place intense pressure on peri-urban agriculture. Studies are showing that there is a surprising amount of open space and usable land which could be allocated or leased for food production, safeguarding a range

of land uses within a framework of medium-long-term, balanced and sustainable agro-urban development (Bouma, 2021). But this land remains unused while waiting for urbanisation permits and the related high revenues for land owners.

The cyclical revision of urban planning instruments can indirectly restrict access to land for food production, as it often happens that peri-urban agricultural land is re-qualified as urban by the planning (or there is an expectation) and the parcel is sold by the 'farmer' to the constructor.

According to the FAO (FAO, 2022) "**Peri-urban** areas are zones of transition from rural to urban land uses located between the outer limits of urban and regional centres and the rural environment. The boundaries of peri-urban areas are porous and transitory as urban development extends into rural and industrial land. Irrespective of how the boundaries move there will always be peri-urban zones."

However, it may take years until works start, sometimes the market situation changes, expectations never materialise, etc. In the meantime, the land remains abandoned for agriculture and becomes degraded.

As shown in Table 1, challenges and opportunities for abandoned agricultural land in peri-urban locations are highly specific and different from those in mountain, islands or other marginal and remote areas. In peri-urban locations, the market for food products is close by, and many opportunities can be found to raise the interest of urban populations in farming, farming skills and leisure demand. There are also problems that are unknown in marginal and remote areas, such as security against robbery of the installed crops, or the quality and availability of the water that is needed for irrigation.

There are many recent examples in Europe of a renewal in small-scale peri-urban agriculture, largely driven by urban consumers. The urban food parks in Madrid or Milan are just a few examples. These and other food proximity schemes are certainly opportunities for the recovery of abandoned agricultural land in the future, even in areas that are prone to speculation pressure from possible urbanisation.

The particular question of peri-urban land under abandonment is further explored in Mini Paper 5 ('What can we do to preserve agriculture in peri-urban areas?').



4. Examples of ongoing recovery initiatives

During the field trip organised as part of the first FG meeting, the experts visited some good practices in Galicia, a region where

agricultural land abandonment is a major territorial, environmental and social issue. These three projects, at different scales and led by different actors in the region, can serve as an inspiration for what is possible to undertake, even in regions where land is already abandoned and shrub encroachment of large extension already forms a strong worry.

Land bank in Galicia

The Land Bank of Galicia, at regional scale, was created and managed by the regional government to connect owners and applicants for agricultural plots. This is a new instrument that was created by the regional government to recover abandoned farmland, with the agreement of most of the owners (70% of the area), the possibility to carry out land consolidation, and the intermediation of the public administration to sell or rent the land to farmers. There is also a tool called Model Villages, through which local (municipality) and regional administrations and owners collaborate to rent the abandoned farmland that surrounds a rural settlement to one or a few farmers.

Galicia, Spain



Lessons learnt: Flexible land rights and land access can help prevent land from being abandoned.

O Rexo farm (Allariz), Galicia

Initiative by the Municipality of Allariz and a local NGO. The abandonment of agricultural land led to a higher risk of forest fires as well as a loss of the production potential. In 2000, the Foundation and the Municipality promoted the instalment of a new sheep dairy farm together with cheese making facilities based on the recovery of formerly abandoned agricultural land for grazing purposes. At the same time, they started with educational and training activities linked to the farm in the realm of pastoralism. The cheese is high quality and the product is sold to the market, which can create added value for the new producers. New grazing areas are now maintained, creating fragmentation in the forest and shrub landscape.

Galicia, Spain



Lessons learnt: Very local level initiatives gathering different actors can create new social and economic dynamics.

'Model Village' O Penedo (Boborás), Galicia

Recovery of abandoned agricultural land in the surroundings of the village, to create protection against fire, by installing a new farm - with extensive pig breeding. The project aims at recovering around 23 hectares of abandoned agricultural land, involving more than 100 landowners and 600 land parcels. This is a project in the frame of a new bundle of instruments by the Galician regional government to recover agricultural land in the surroundings of rural villages. The municipality has a key mediation and facilitation role, getting in contact with landowners and raising the support and adhesion that is needed to develop the project. AGADER, a local association, provides technical, financial and legal support.

Galicia, Spain



Lessons learnt: Smart legal instruments create the frame that is needed for the emergence of local initiatives adapted to each territory needs.



5. Research needs

The research needs that were identified by the FG experts are related to the challenges identified above. They are summarised below:

- › 1. Characterise the specificity of the land abandonment process in different geographical contexts and classify the specific combination of the drivers leading to abandonment – so that solutions for recovery can also be better tailored.
- › 2. Combine information sources to map with precision and reliability the state of land in remote and marginal areas with high risk of abandonment: which land is definitively abandoned, which is severely affected but with a possibility for new uses. Establish benchmarks for the status of abandonment. Based on the most advanced remote sensing techniques combined with field work, select spatial indicators that can make this assessment and monitoring straightforward.
- › 3. In high risk areas in relation to land abandonment (for example certain areas in Spain, Portugal, Greece): a) assess the influential factors related to transaction costs of land ownership or use rights, such as unknown ownership, co-ownership, or inaccurate land registers, and identify and test solutions to overcome these limitations, with assessment of advantages and drawbacks; b) explore factors that hinder higher mobility of land markets and factors preventing land owners from engaging into land markets, including the issues related to tenure security, behavioural and psychological factors; finding the most efficient and pragmatic ways to identify the owners of existing rights and mapping property boundaries. This is about new or adapted legal instruments and approaches, and their articulation with economic incentives.
- › 4. Assess the potential of the LAGs and LEADER approach to support mitigation actions of land abandonment; identify best approaches for each geographical, cultural and institutional context.
- › 5. Identify and propose new forms of collective arrangements that can help cope with the extreme fragmentation in property, that can result in parcels that can be used by the same farm systems, and support viability in business models.
- › 6. Identify entrepreneurial, collaboration or other soft skills required for individuals who want to set up an enterprise in areas under land abandonment risk or already abandoned areas, and which training modules and support structures can better create the conditions for these skills to be acquired.
- › 7. Find and develop alternative crops or animal productions and strategies, best adapted to the context of abandoned land, or other ways to bring more added value into the farm enterprise, by processing in the farm, or collectively in the region, or/and by shared marketing strategies.
- › 8. Find specific innovative technical solutions for animal or crop production that are at the same time affordable and easy to handle in order to facilitate the use of remote and abandoned areas, easing the burden of heavy manual work that is still required in many areas.
- › 9. Find innovative grazing strategies that can support a business model for livestock production and at the same time be supported with public policies due to its nature and conservation value.
- › 10. Explore a case on the sustainable use of available biomass in abandoned land for soil improvement, energy production, building materials or other biobased industries; identify how to build biomass-based processing units that can make a sustainable business in remote areas.
- › 11. Identification of a new way to think of rural community, engaging different stakeholders, and making use of modern digital and other new technologies to enable this. Assess what the digital network minimum needs are for the digital transition to be made a reality, also in remote rural areas.
- › 12. Discuss and assess spatial planning instruments and approaches to be used to tackle the risk of land abandonment where not only the viability of one isolated farm is analysed and optimised but the viability of a whole region is considered through small-scale regional cultivation, food systems approaches and management plans that engage farmers, enterprises and municipalities all along a territorialised food system.
- › 13. Identify how to integrate different 'peri-urban food visions' and how to improve cooperation among the different food sectors in peri-urban areas – through planning, initiatives from the farming sector, landowners (public and private owners), legislation regarding food markets, post-harvesting facilities.
- › 14. Cost and benefit analysis of abandonment versus keeping land under production: assess the cost of non-action – how much does it cost, in loss of ecosystems services, to let agricultural land go under abandonment, in marginal and remote areas or in peri-urban areas. The multiple benefits or ecosystem services may be adaptation and mitigation to climate change, landscape quality, mental health benefits for citizens and bringing children to the outdoors (mostly in peri-urban contexts), improving biodiversity, territorial cohesion, etc.



6. Ideas for Operational Groups and other innovative projects

In the same way, ideas for future Operational Groups were discussed. The proposals by different members of the Focus Group were presented and prioritised. The four most voted ideas were:

- › 1. Development of biomass value chains with different uses of the biomass: set up and test a biomass processing unit using available biomass in abandoned land, and explore viable ways to use that biomass for soil improvement, energy production, building materials, other biobased industry; assess the viability of such biomass-based processing units in remote areas.
- › 2. Development of value chains based on the specificity & native species of the local areas: set up value chain arrangements of products where the added value is mainly based on their territory of origin and their specificity.



- › 3. Platform exchange and information for business opportunities and partnerships: Develop and set in place a platform or online marketplace, where farmers or municipalities can offer activities on and around their farms for tourism or other activities, or offer team events and recreational activities for businesses and other groups. On such a platform, farmers can offer and promote activities such as prevention of shrub encroachment, building traditional stone walls, fencing, building troughs, mowing mountain meadows etc. Also, a platform where new entrants to farming can find the local stakeholders and other farmers can be relevant.
- › 4. Classification of the status of the land which show signs of being abandoned, using participatory approaches and other complementary methods to mapping the status and boundaries of abandoned land with precision.



However, many other ideas were discussed. We hereby list, with a simple explanation, the remaining proposals for Operational Groups which emerged from the experts' discussions.

- › 1. Identify and test solutions for initiating new rights of use of the land and creating conditions for new enterprises to be installed, when ownership is unknown or dispersed among multiple owners who are not interested in the land.
- › 2. Test and validate collective arrangements that can lead to more efficient use of the land with risk of abandonment or land that is already abandoned; these can be collective ways of using the land, or of processing, transportation and connecting to the market.
- › 3. Set in place specific training modules for enhancing entrepreneurial and collaboration skills and other soft skills, in individuals who can invest in new business models in areas that are prone to abandonment or that are already abandoned.
- › 4. Set in place specific training modules for practices of sustainable land - and soil - management, and guidance for the transition for such practices, in marginal and remote areas.
- › 5. Dissemination of information and easy-to-apply calculators for values added and possible income sources related with biodiversity credits and carbon sequestration, for example.
- › 6. Develop and set in place collective processing units that can make use of the production of abandoned or marginal land, develop new marketing strategies and create more added value to the farm business.
- › 7. Test new or old crops or animal varieties, or farm systems, that can be best adapted to the conditions of marginal and remote areas, which were not viable some decades or years ago due to inexistent technologies but which can be made more viable with the use of new varieties or production factors or technologies.



- > 8. Test and set in place training modules regarding agroforestry and grazing strategies that are adapted to marginal and remote areas with high risk of abandonment or that are already abandoned; promote the conservation interest of such grazing activities, like the status of High Nature Value farming systems.
- > 9. Set in place short supply chains linking peri-urban agriculture to urban consumers as a way to re-activate the use of peri-urban farmland under abandonment, through negotiation of user rights with land owners.



7. Conclusion

Recovery of abandoned farmland is a highly actual issue in Europe. The risks of keeping large extensions of remote areas, where the population is very scarce, under abandonment are very high, not the least because of the risk of extreme fires, decay in crop biodiversity and genetic capital, loss of biodiversity, loss of landscape character and identity, and accentuated depopulation. On the other side, there are those who defend the advantages of biodiversity, rewilding trends and keeping large areas with no human interference.

In this Focus Group, we were most worried with the negative impacts of land abandonment. The main question of the Focus Group was How to foster new, practical ways for better management of abandoned agricultural land in a sustainable way?

In order to do this, FG experts have identified and largely discussed the mechanisms which hinder strategies for recovery of abandoned land and which, when solved, can be the ground for such strategies: land tenure and farm structure, including the precise identification of land right owners; the identification and motivation of the multiple stakeholders required for collaboration and recovery strategies to become successful; factors that need to be in place for business models to be viable, in the land abandonment context; sustainable

land and particularly soil management towards resilient farm systems; and finally, the particular case of land abandonment in peri-urban areas.

It has become clear from the discussions and collected evidence, that agricultural land abandonment has significant and worrying dimensions in many remote and peripheral regions of Europe, has been ongoing for decades, is associated with social and economic decay of the regions where it is found – and therefore requires a strong political investment with dedicated efforts and resources to be dealt with. It has also become clear that recovery will never be possible in all areas where land is abandoned. A selection will have to be done, if efforts are to be successful.

And those areas where recovery is not possible should be managed, as rewilding and biodiversity reserves and as protection of fragile soils against further degradation – which also requires some form of intervention and management, for instance to control fire risks.

Many bottom-up initiatives can help recovery. Local organisations, projects, collective arrangements, training modules for entrepreneurship and for sustainable land management practices, can foster the way. But there are issues of land abandonment mapping, property boundaries where farm structure was highly fragmented when abandonment took place, identification of ownership right holders, and support to the emergence of viable enterprises, that demand robust public intervention, at local, regional or national level. These are needed especially because the regions where agricultural land abandonment is a most severe problem also register demographic decay and lack strong governance structures – and are therefore weak in entrepreneurial capacity.

The exception is in the recovery of land abandonment in peri-urban areas, where private initiatives of connection between farm production to local urban consumers, and of urban population engaging in farming as leisure and as self-production, can create pressure to recover the land that is currently abandoned.



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Annex 1

List of FG experts

Family name	First name	Professional background	Country
AMADOR GARCIA	Alberto	Other	Spain
BERGOUNIOUX	Flavie	Civil servant	France
CARTWRIGHT	Andrew	Researcher	Hungary
DELGADO	Cecília	Other	Portugal
DI GIUSEPPE	Pierfrancesco	Farmer	Italy
FEEHAN	John	Advisor	Ireland
GATSIOU	Aimilia	Civil servant	Greece
GIULIANO	Giuseppe	Advisor	Italy
GORGAN	Maxim	Other	Hungary
KONTOGIANNIS	Theo	Advisor	Greece
LAZARO	Juan Antonio	Other	Spain
MARTINS SANTOS FONSECA	Carlos Manuel	Farmer	Portugal
PAGÈS	Yolène	Farmer	France
PECENKA	Ralf	Researcher	Germany
PEPKOWSKA-KRÓL	Aleksandra	Working at an NGO	Poland
PETRIE	Gert Jan	Farmer	Netherlands
SANTE RIVEIRA	Ines	Other	Spain
WEBER	Thomas	Other	Austria
ZDRULI	Pandi	Researcher	Italy



Annex 2

List of Mini Papers

MP	Mini Paper title	Core Team
1	<u>Land Abandonment: Identification and Assessment of Viable Business Models</u>	John Feehan, Pierfrancesco di Giuseppe, Alberto Amador Garcia, Giuseppe Giuliano, Yolène Pagés, Ralf Pacenka, Thomas Maximilian Weber
2	<u>Sustainable Land Management as a Lever to Land Abandonment</u>	Pandi Zdruli, Carlos Fonseca, Alberto Amador Garcia, Theo Kontogianis, Aimilia (Emily) Gatsiou, Aleksandra Pepkowska Krol, Gert Jan Petrie, Thomas Maximilian
3	<u>Ownership, Farm Structure and Behavioural Aspects of Land Abandonment</u>	Maxim Gorgan, Flavie Bergounioux, Aimilia Gatsiou
4	<u>Securing Stakeholder Involvement in the Recovery of Abandoned Farmland</u>	Flavie Bergounioux, Andrew Cartwright, Inés Santé Riveira
5	<u>What Can We Do to Preserve Agriculture in Peri-Urban Areas?</u>	Cecília Delgado, Juan Antonio Lázaro, Gert Jan Petrie



Support Facility Innovation & knowledge exchange | EIP-AGRI
Koning Albert II laan 15 - 1210
Brussels - BELGIUM
+32 (0) 2 543 72 81
innovation-knowledge@eucapnetwork.eu

